

CLAIMS

1. A method for operating a low frequency cryocooler system comprising:

(A) generating pulsing gas at a frequency of at least 25 hertz by compressing a gas using a moving element moving proximate a surrounding wall wherein no oil is employed between the moving element and the surrounding wall;

(B) passing the pulsing gas through a frequency modulation valve and reducing the frequency of the pulsing gas to produce lower frequency pulsing gas; and

(C) passing the lower frequency pulsing gas to a regenerator which is in flow communication with a thermal buffer tube.

2. The method of claim 1 wherein the moving element is a piston driven by an axially reciprocating electromagnetic transducer.

3. The method of claim 1 wherein the pulsing gas is passed through a discharge frequency modulating volume prior to being passed through the valve.

4. The method of claim 3 wherein the discharge frequency modulating volume includes a reservoir.

5. The method of claim 1 wherein the lower frequency pulsing gas has a frequency of less than 10 hertz.

6. A low frequency cryocooler system comprising:

(A) a compressor having a discharge and having a moving element proximate a surrounding wall wherein no oil is employed between the moving element and the surrounding wall;

(B) a regenerator, a frequency modulation valve, discharge conduit extending from the discharge to the frequency modulation valve, and regenerator input/output conduit extending from the frequency modulation valve to the regenerator; and

(C) a thermal buffer tube in flow communication with the regenerator.

7. The low frequency pulse tube system of claim 6 wherein the compressor is a linear compressor and the moving element is a piston driven by an axially reciprocating electromagnetic transducer.

8. The low frequency pulse tube system of claim 6 wherein the frequency modulation valve is a rotary valve.

9. The low frequency pulse tube system of claim 8 further comprising suction conduit extending from the rotary valve to the compressor suction.

10. The low frequency pulse tube system of claim 6 further comprising a reservoir positioned on the discharge conduit between the discharge and the frequency modulation valve to comprise a discharge frequency modulating volume.

11. The low frequency pulse tube system of claim 9 further comprising a reservoir positioned on the suction conduit between the rotary valve and the compressor suction to comprise a suction frequency modulating volume.